VAX-UNIBUS SC31/SC21
INSTALLATION DIAGNOSTIC SOFTWARE (IUD31)
USER'S GUIDE

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VX9950921 Rev A
February, 1986

Printed in U.S.A.

This diagnostic distribution kit contains the following diagnostic distribution media:

Emulex P/N	Description
VX9960406	TU58 cassette for VAX-11/750
VX9960506	Eight-inch floppy diskette for VAX-11/780
VX9960910	Nine-track, 1600 BPI magnetic tape for VAX-8600

This kit contains the following User's Manuals to document the programs contained on the distribution media:

Title: Emulex VAX Monitor (EVM) User's Guide
Publication Number: VX9950901

Title: SC21/B1 SC21/V1 SC21/BE SC21/BF SC21/BM (RM02/RM03/RM05 Compatible) Disk Controller Technical Manual
Publication Number: SC7551001

Title: SC31/BX (RM02/RM03/RM05/RM80, RP06 Compatible) Disk Controller Technical Manual
Publication Number: SC3151001

TABLE OF CONTENTS

EMULEX PRODUCT WARRANTY

SOFTWARE WARRANTY: Emulex warrants for a period of ninety (90) days, either from the date of installation or thirty (30) days after shipment, which ever comes first, that each software package supplied shall be free from defects and shall operate according to Emulex specifications under those Digital Equipment Corporation ("DEC") operating system versions supported by Emulex. Emulex does not warrant its software products under any operating system which has not been specifically identified. Any software revisions required hereunder will cover supply of distribution media only and will not cover on-site installation of integration.

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1.1 INTRODUCTION

This manual is designed to serve as a guide for those using the Emulex VAX-Unibus SC31/SC21 Installation Diagnostic, IUD31, on Digital Equipment Corporation (DEC) VAX-11 computers. IUD31 is designed to run under the Emulex VAX Monitor (EVM).

This utility is designed for use by qualified installers of Emulex equipment, and thus it assumes that the user has some knowledge of hardware configurations, VAX architecture and terminology, and interpretation of error messages and device register contents.

The document contains three main sections:

Section 1	**General Description:** This section contains an overview of the IUD31 installation diagnostic, including its functions, hardware and software compatibility, distribution media, and related documentation.
Section 2	**Operation:** Describes operation of IUD31, including load and start procedures, diagnostic tests, and sample output.
Section 3	**Service:** This section explains Emulex service policies.

1.2 PRODUCT OVERVIEW

IUD31 is a diagnostic module that is designed for installation and verification of Emulex VAX disk controllers. This diagnostic emulates DEC's RM02, RM03, RM05, RM80, and RP06 disk controllers. Although the diagnostic program does not perform any destructive writes to the disk, a formatted disk is required, and the disk should be write-enabled so that the test can function correctly. Tests are organized in a progressive manner, such that each test is dependent upon the successful completion of the previous test; however, tests can be run independently. The first twelve tests verify functionality of the controller registers. The remaining tests verify major functions of the controller-to-disk operations.

Because this program is basically an installation and verification diagnostic, it does not check for the reliability of data transfer between the host and the mass storage device. This function is performed by a reliability diagnostic program. Therefore, running this diagnostic does not destroy user data, and a scratch disk pack is not required.

1.3 DISTRIBUTION MEDIA

The following table lists and describes distribution media for IUD31.

Emulex P/N	Description
VX9960406	TU58 cassette for VAX-11/750
VX9960506	Eight-inch floppy diskette for VAX-11/780
VX9960910	Nine-track, 1600 BPI magnetic tape for VAX-8600

1.4 COMPATIBILITY

1.4.1 HARDWARE

IUD31 will run on any DEC VAX-11/750 or 11/780 system with the following minimum hardware:

- Console device
- 256K bytes memory
- SC21 or SC31 disk controller
- SMD-type disk drive (CDC, Fujitsu, Ampex, etc.)

1.4.2 SOFTWARE

IUD31 is designed to run under the Emulex VAX Monitor, EVM. For more detailed information regarding EVM, see the EVM User's Guide, referenced in subsection 1.5 of this document.

1.5 RELATED DOCUMENTATION

The following publications are available from Emulex Corporation at the address given below:

Title:	Emulex VAX Monitor (EVM) User's Guide
Publication Number:	VX9950901
Title:	SC21/B1 SC21/V1 SC21/BE SC21/BF SC21/BM (RM02/RM03/RM05 Compatible) Disk Controller Technical Manual
Publication Number:	SC7551001

Title: SC31/BX (RM02/RM03/RM05/RM80, RP06 Compatible) Disk Controller Technical Manual
Publication Number: SC3151001

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1.6 DIAGNOSTIC TESTS

1.6.1 TEST 1: REGISTER ACCESSIBILTY TEST

This test will read each register and verify their contents according to expected values.

1.6.2 TEST 2: BITWISE TEST ON CONTROL/STATUS (RMCS1) REGISTER

This test will perform a bitwise test (examination of individual bits) of the Control/Status Register 1 (RMCS1) (except the GO bit).

1.6.3 TEST 3: TEST FUNCTION BITS

This test will perform a bitwise test of each of the function bits.

1.6.4 TEST 4: TEST WORD COUNT (WC) REGISTER

This test will check to make sure that the word count register is functional.

1.6.5 TEST 5: CHECK WORD COUNT WITH SINGLE 1 BIT, SINGLE 0 BIT

This test will change the word count register one bit at a time to ensure that each bit can be cleared and set.

1.6.6 TEST 6: CHECK TO SEE THAT BUS ADDRESS REGISTER CAN BE LOADED

This test will load the bus address and verify its intended contents.

1.6.7 TEST 7: CHECK BUS ADDRESS WITH FLOATING BIT

This test will change the word count register one bit at a time to ensure that each bit can be cleared and set.

1.6.8 TEST 8: CHECK MAINTENANCE REGISTER (MR1)

This test will check the MR1 register to see if it can hold intended values. Note this test may not apply to all drives types.

1.6.9 TEST 9: CHECK THE DESIRED CYLINDER (DC) REGISTER

This test will check to see if the DC register will hold all 1's and all 0's.

1.6.10 TEST 10: CHECK THE DESIRED CYLINDER (DC) REGISTER

This test will perform a bitwise test of the DC register.

1.6.11 TEST 11: CHECK DISK ADDRESS (DA) REGISTER

This test will check to see if the DA register will hold all 1's and all 0's.

1.6.12 TEST 12: BITWISE TEST ON THE DISK ADDRESS (DA) REGISTER

This test will perform a bitwise test of the Disk Address Register to make sure it is functional.

1.6.13 TEST 13: ILLEGAL COMMAND TEST

This test will check to see if the illegal function command is returning proper status.

1.6.14 TEST 14: CHECK INVALID ACCESS OF DATA BUFFER

This test will perform an invalid access to the Data Register to make sure an error condition occurs.

1.6.15 TEST 15: CHECK SPECIAL CONDITION BIT

This test check to see if a Special Condition will cause an interrupt to occur.

1.6.16 TEST 16: CHECK THE INTERRUPT ENABLE (IE) AND READY (RDY) BIT

This test will check to see if IE and RDY bit will cause an interrupt.

1.6.17 TEST 17: CHECK PACK ACKNOWLEDGE COMMAND

This test will check to see if the Pack Acknowledge (PAK ACK) command will set the Valid Volume (VV) bit.

1.6.18 TEST 18: CHECK INVALID COMMAND (IVC)

This test will check to see if the IVC bit is set in Error Register 2 (ER2) when a command is used with a cleared Medium Online bit.

1.6.19 TEST 19: TEST BUS ADDRESS REGISTER

This test will check the Bus Address (BA) register by incrementing its contents.

1.6.20 TEST 20: CHECK ADDRESS INCREMENT INHIBIT (BAI) BIT

This test will check that when the BAI bit is set, the Bus Address contents will not change value.

1.6.21 TEST 21: GET CONFIGURATION TEST

This test will extract the controller configuration data and display to the user.

The output format for this test would appear follows:

```
Emulex SC21/SC31 Disk Controller CSR  [177777]
vector [377] is configured as an [rmnn]
port number [77]
firmware rev [FF]
switches [377] octal
maximum cylinder address = [9999]
maximum track address = [999]
maximum sector address = [99]
```

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2.1 OVERVIEW

This subsection describes IUD31 load and start procedures, defines the tests available with IUD31, and presents sample output.

Operator responses to EVM and IUD31 prompts appear in **bold** print. The symbol **<return>** indicates a carriage return key.

As used in prompts, the abbreviation DEC signifies decimal radix rather than Digital Equipment Corporation. Prompts for numeric parameters include the minimum and maximum acceptable values, followed by the default value in parentheses. The following example illustrates these conventions:

```
Enter drive number to test [DEC - 0,7,(0)]>>>
```

2.2 LOAD AND START PROCEDURES

The procedure used to invoke EVM varies from one VAX system to another. For a description of EVM bootstrapping procedures, see the Emulex VAX Monitor (EVM) User's Guide (reference given in subsection 1.5).

2.2.1 LOAD PROCEDURE

After the EVM> prompt has appeared on the screen, type the following:

EVM>**LOAD IUD31<return>**

The LOAD statement is followed by a SET CONFIGURATION statement, the content of which depends upon the configuration of the VAX system being used. Sample configure statements are presented in the following subsections. For information regarding EVM command syntax and abbreviations, see the EVM User's Guide.

2.2.2 DEVICE LINK TABLE

IUD31 has the following default hardware configuration defined in the device link table for both the VAX-11/750 and the VAX-11/780:

Transfer Request (TR) Level 3
Bus Request (BR) Level 5
Adapter Number (AD) 0
Control Status Register (CSR) Supplied by EVM
Interrupt Vector 254 (X)
UNIBUS Bus Request (UBR) Level 5
Unit Under Test (DR) 0

2.2.3 SAMPLE CONFIGURE AND START STATEMENTS FOR VAX-11/750

The following sample user input (in **bold** type) sets the default adapter to 3, the unit under test to 5, and the bus request level to 6, and starts tests 1 through 21 in three passes:

```
EVM>SET CON/AD:3/DR:5/BR:6<return>

EVM>ST/T:1:21/PASS:3<return>
```

If no range of test numbers is specified, the EVM assumes that all tests are to be run. The number of passes needs to be specified only if more than one pass is desired; the default value is 1.

2.2.4 SAMPLE CONFIGURE AND START STATEMENTS FOR VAX-11/780

The following sample user input (in **bold** type) sets the transfer request level to 12, the unit under test to 3, and the bus request level to 6, and starts tests 1 through 21 in three passes:

```
EVM>SET CON/TR:12/DR:3/BR:6<return>

EVM>ST/T:1:21/PASS:3<return>
```

If no range of test numbers is specified, the EVM assumes that all tests are to be run. The number of passes needs to be specified only if more than one pass is desired; the default value is 1.

For additional information regarding the DEBUG command, see the EVM User's Manual.

2.3 SAMPLE OUTPUT

The following depicts a sample printout of the diagnostic program run. The diagnostic displays the program title and then prints out the title of each test, followed by a summary report. In this example, the operator did not use any command qualifiers with ST (START), so the program will run one pass of all 21 tests. The use of command qualifiers is discussed in the EVM Users Manual.

```
EVM>ST<return>

Emulex SC21/SC31 Disk Controller Diagnostic Rev X0.1
28-OCT-1985 10:42:14

Enter drive number to test [DEC - 0,7,(0)]>>>
```

```
-----> BEGINNING OF PASS 1

TEST # 1 address all registers  28-OCT-1985  11:11:32
TEST # 2 CS1 register (all 1 & 0)  28-OCT-1985 11:11:32
TEST # 3 function bits (moving 1 & 0)  28-OCT-1985 11:11:32
TEST # 4 WC register (all 1 & 0)  28-OCT-1985 11:11:33
TEST # 5 WC register (moving 1 & 0)  28-OCT-1985 11:11:33
TEST # 6 BA register (all 1 & 0)  28-OCT-1985 11:11:33
TEST # 7 BA register (moving 1 & 0)  28-OCT-1985 11:11:33
TEST # 8 MR1 bits can be set & cleared  28-OCT-1985 11:11:34
TEST # 9 DC register (all 1 & 0)  28-OCT-1985 11:11:34
TEST # 10 DC register (moving 1 & 0)  28-OCT-1985 11:11:34
TEST # 11 DA register (all 1 & 0)  28-OCT-1985 11:11:36
TEST # 12 DA register (moving 1 & 0)  28-OCT-1985 11:11:36
TEST # 13 invalid commands give error  28-OCT-1985 11:11:36
TEST # 14 invalid DB access gets error  28-OCT-1985 11:11:39
TEST # 15 SC bit set causes interrupt  28-OCT-1985 11:11:40
TEST # 16 IE & RDY set cause interrupt  28-OCT-1985 11:11:40
TEST # 17 check that PACK ACK set VV  28-OCT-1985 11:11:40
TEST # 18 test IVC bit  28-OCT-1985 11:11:41
TEST # 19 increment bus address register  28-OCT-1985 11:11:42
TEST # 20 test BAI bit  28-OCT-1985 11:11:42
TEST # 21 get controller configuration  28-OCT-1985 11:11:43

Emulex SC21/SC31 Disk Controller CSR [176700]
vector [254] is configured as an [RM02]
port number [1]
firmware rev [7]
switches [0] octal
maximum cylinder address = 823.
maximum track address = 5.
maximum sector address = 32.

-----> END OF PASS 1


SUMMARY REPORT:
  TOTAL # ERRORS = 0 (0 SYSTEM, 0 DEVICE, 0 HARD, 0 SOFT)
  28-OCT-1985 11:11:46

EVM>
```

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Emulex thoroughly tests its products. IF IUD31 indicates a malfunction with the disk controller or if you have trouble with IUD31 itself, contact Emulex or its representative.

In the continental United States, Alaska, and Hawaii contact:

Emulex Technical Support
3545 Harbor Boulevard
Costa Mesa, CA 92626
(714) 662-5600 TWX 910-595-2521
(800) 854-7112 Outside of California Only

Outside the United States, contact the distributor from whom the product was initially purchased.

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